

Great Lakes Regional Fisheries Extension Enhancement Work Plan

Great Lakes Fisheries Leadership Curriculum Development

Background

Discussion with Great Lakes partner agencies including the Great Lakes Fishery Commission, U.S. Fish and Wildlife Service, USGS/BRD Great Lakes Science Center and NOAA/Great Lakes Environmental Research Laboratory revealed an urgent regional need for in-depth training to the next generation of leaders - i.e., those who are new leaders to their fisheries related organizations, those likely to become leaders of their organizations within the next few years, and those likely to be serving as advisors to Great Lakes fishery related institutions such as Lake Committees. These fisheries professionals note that the average citizen volunteer involved in Great Lakes fishery issues stays involved approximately five years, but that it takes two to three of those years to educate citizen volunteers in the issues, science, and policy in order for them to be most effective. The Great Lakes Fishery Leadership Curriculum developed through this work plan and the Great Lakes Fishery Leadership Institute (proposed under the National Competition) are designed to address this knowledge gap.

Great Lakes Fisheries Leadership Curriculum Development

The goal of the Great Lakes Sea Grant Network Fisheries Extension Enhancement Program is to develop a consistent curriculum for training fisheries stakeholders throughout the Great Lakes basin. Development of a consistent curriculum will enhance regional integration of Great Lakes fisheries extension efforts. This curriculum will be specifically targeted to enable emerging leadership to more effectively participate in public policy decision-making as it relates to Great Lakes and Lake Champlain fishery resources. This central curriculum will also be valuable in training a variety of Great Lakes interest groups including anglers, commercial fishermen, tribal fishermen, environmental NGO's, and high school students and will form the foundation for a long-term, sustained expansion of the Great Lakes Sea Grant Fisheries extension program.

Funding for the delivery of this curriculum (i.e., workshops) is not included in this proposal. Delivery of this curriculum to its primary target audience by the individual Great Lakes Sea Grant College programs and partners will be greatly enhanced by approval of the Great Lakes Sea Grant Network proposal under the National Competition titled "*Fisheries Extension Enhancement: Great Lakes Fisheries Leadership Institute*".

The proposed work includes development of seven curriculum modules as well as six specific projects deemed essential to the curricula development. Modules were determined as needed to cover essential topics to understanding the Great Lakes Fishery and its management in a systematic context. Modules are essentially independent - they can be used separately and in any order. Individual modules are not necessarily equivalent in length. Specific projects are essentially independent, though in many cases they support development of a specific module (in these cases, the project is listed following the module which it supports). The curriculum will be peer reviewed by our state, federal, and tribal partners for clarity, accuracy, and relevance for use in the Great Lakes Leadership Institute.

Project 1: Update "Life of the Lakes"

The "Life of the Lakes: The Great Lakes Fishery" was developed by the Great Lakes Sea Grant Network and produced by Michigan Sea Grant in the early 1990's. Although it was developed primarily for a high school audience, fourth grade through college level educators have used it, as have resource professionals. This set of materials has met the high educational standards of the American Fisheries Society Educational Committee and has ranked well in evaluative research conducted for the Great Lakes Fishery Trust. Few complete sets remain, and developments over the last decade have rendered several aspects of the materials out-of-date. Therefore, *The Life of the Lakes* products will be reviewed and updates will be developed to use as a foundation educational curriculum component for the Great Lakes Fishery Leadership Institute, as well as continuing its use with the originally targeted audiences. The content of the update will parallel the structure established by the original – changes in technology, the environment, society, and the fishery. New modules will focus on aquatic nuisance species, habitat change and loss and other issues related to fishery health. A stand-alone educational component of "The Life of the Lakes," such as a CD, can be utilized in many venues (e.g., classrooms, workshops, nature centers) to encourage children and adults to be stewards of the Great Lakes. All Great Lakes Sea Grant programs will be encouraged to provide content and input into the revised materials. Michigan Sea Grant (Elizabeth LaPorte) will coordinate the effort to produce and market an updated version of *The Life of the Lakes* incorporating new technologies such as CD, digital video and web-based components.

Module 1: Aquatic Science

Leaders interested in Great Lakes fishery issues need to have a basic understanding of the biological basis for fish production in the natural waters of the Great Lakes. This module is an attempt to reduce the biological information and understanding gap between key users of the resource and biologists who manage the resource. Ohio will take the lead in developing concise informational products based on an introductory aquatic science curriculum now being used at Ohio State's F.T. Stone Laboratory located on Gibraltar Island in Lake Erie's western basin. This includes basic food web science, base of the food web impacts on fish, benthic organisms & fish interactions, basic fish biology and beginning fish identification. Incorporating current Great Lakes science, case studies, and current issues will be included. To the greatest extent possible the use of existing materials will be encouraged. All Great Lakes Sea Grant programs and many of our federal agency partners (such as NOAA's Great Lakes Environmental Research Laboratory) will provide input into this module.

Project 2: Wisconsin Fish ID CD-ROM

Wisconsin Sea Grant will complete its Wisconsin Fish Identification CD-ROM. This interactive CD-ROM provides the user the ability to identify fish using color photos of live specimens, a variety of body structures such as scales, colors, mouth parts, fins, in addition to scientific name and common name. Development of a website (<http://144.92.62.239/newfishtest/>) incorporating these features is nearly complete. Once complete, the information will be copied onto the CD-ROM for easy distribution and mobile access. The Fishes of Wisconsin ID CD-ROM will serve

as a template for development of a similar Great Lakes Fish ID CD-ROM. The unique use of color photos of live specimens with easy-to-identify structures rather than scale counts will provide this interactive product with the potential to be a critical tool for the identification of Great Lakes fish by non-specialists.

Module 2: Aquatic Nuisance Species Effects on Sustainability

Aquatic Nuisance Species (ANS) have dramatically altered Great Lakes ecosystems during the previous 75 years with associated significant changes in the fisheries. Sea Lamprey, rainbow smelt, alewife, round goby, ruffe, common carp, white perch, and spiny water fleas now compete with or prey upon various life stages of native Great Lakes fishes. Dreissenid mussels and other benthic organisms are altering the food web upon which native and stocked fishes rely for forage. The activities of some non-native aquatic species adversely affect the habitat for economically important species and the species upon which they forage. Anglers and commercial fishers need to understand how non-native aquatic species have modified the ability of the lakes to sustain populations of economically important fish species. This purpose of this module is to help anglers and fishers understand the effects aquatic nuisance species have had on the carrying capacity of the Great Lakes and how this will affect the abundance and sustainability of their fisheries in the future. This module will also introduce participants to Great Lakes ballast water policy and regional efforts to prevent the introduction and spread of aquatic nuisance species in the Great Lakes - St. Lawrence system. Wisconsin Sea Grant will lead development of this module with assistance from Illinois-Indiana, Michigan, Minnesota and Lake Champlain Sea Grant programs as well as with input from many of our federal agency partners (such as NOAA's Great Lakes Environmental Research Laboratory). A new partnership among the Great Lakes Fishery Trust, the Great Lakes Sea Grant Network, and the Great Lakes Fishery Commission on food web disruption should help provide coordinated research in the Great Lakes region supporting this key issue area.

Module 3: Fisheries Habitat

In order to understand current fish populations and the response populations have to management practices, leaders must understand the role fisheries habitat plays in sustaining viable reproducing fish populations. Each fish species has specific habitat requirements for spawning, feeding and cover. In addition, individual species habitat requirements vary greatly across life history stages. All of these habitats must remain healthy and be spatially available in patterns that are consistent with fisheries management objectives. If fish management objectives are to be sustainably achieved, future leaders must understand the essential role fisheries habitat plays in the overall productivity, health, and management of Great Lakes fisheries. This module will be based on current Great Lakes science and will address current issues affecting fisheries habitat. The basic science of what composes essential fish habitat will be introduced. Natural processes that affect Great Lakes Fisheries habitat (i.e., fluctuating water levels, storm events, etc.) will be discussed and the role these influences play in habitat succession and long-term habitat sustainability will be explained. The habitat degradation that has occurred in the Great Lakes will be described and the affect this has had on fish populations will be presented to the extent

possible. Current restoration techniques and efforts being conducted in the Great Lakes by agencies and angler organizations will be described and quantified to the extent possible. This module will end with a presentation of critical issues that must be addressed and actions that are needed to sustain and improve fish habitat in the Great Lakes. This module will be led by Illinois-Indiana Sea Grant with assistance from the Lake Champlain, Ohio, and Minnesota Sea Grant programs and with input from many of our federal agency partners (such as the Department of the Interior's USGS/BRD Great Lakes Science Center).

Project 3: Coaster Brook Trout Synthesis

Minnesota Sea Grant will develop extension materials and programs to be used as a case study of native fishery restoration by participants in the Great Lakes. Fishery Leadership Institute based on the synthesis information produced by participants in a regional workshop focusing on coaster brook trout. These materials will also be used by the coaster brook trout workshop participants and others in their work with interested citizens, environmental groups, angler organizations, and decision makers. Minnesota Sea Grant will work with a variety of Great Lakes partners to facilitate this regional workshop focusing on coaster brook trout. The primary goal of this workshop is to identify our current state of knowledge, information gaps, and current management perspectives regarding coaster brook trout. A preliminary list of theme areas to be addressed at this workshop includes stream habitat, lake habitat, brook trout genetics, interactions with other species, behavior, and coaster brook trout population status/management perspectives and techniques. Workshop participants will produce a publishable synthesis of our knowledge base, recommendations for future research, and management suggestions which will form the basis for these extension materials. Wisconsin Sea Grant and Wisconsin Cooperative Extension will play a key role in this effort.

Module 4: Contaminant Issues Relevant to Great Lakes Fisheries

Toxic chemical contaminants are a critical issue for the Great Lakes fishery in terms of sustainability of the fishery (habitat and reproduction) as well as public safety (consumption). Scientists have detected more than 360 contaminants in the Great Lakes ecosystem, many of which are known to have an adverse impact on plant and animal life, including humans. Eleven of these contaminants have been identified by the International Joint Commission as posing the greatest concern and has designated 43 sites in the Great Lakes as Areas of Concern due primarily to sediment contamination. Topics to be covered in the curriculum include:

- fish advisories – focusing on current fish consumption advisories listed for the Great Lakes, at-risk populations, contaminants of concern, and the use of risk assessments and epidemiological studies in developing consumption advisories;
- fish tumors - focusing on the role that pollutants play in tumor formation in fish and how this is being used as an indicator of water quality and sediment conditions in Great Lakes Areas of Concern;
- avian botulism - including information on the current outbreak in Lake Erie and possible

- ramifications relating to fish and bird kills and human health concerns;
 - estrogenic substances – examining their suspected role in hormone mimicking and how they may affect the fish and wildlife populations in the Great Lakes.

Pennsylvania Sea Grant extension program leader, Eric Obert, will take the lead on development of a curriculum for contaminant issues related to Great Lakes fisheries. Staff from Ohio and Michigan Sea Grant will assist in the curriculum development, with Great Lakes Environmental Research Laboratory and United States Geological Survey researchers providing case studies and current research related to contaminants levels and effects on Great Lakes fish.

Module 5: Fisheries Management

Great Lakes fisheries have undergone tremendous change over the last 50 years. Introduction of non-native species, over fishing, pollution, and habitat loss have all had impacts. These fishery management challenges were met with what some have called a fishery management miracle. Lake Michigan, which suffered a nuisance alewife explosion and the decimation of lake trout by sea lamprey, made an unprecedented turnabout in the 1970s through the introduction of Pacific salmon. Lake Ontario underwent a similar metamorphosis. Lake Erie rebounded from its pollution problems and went from "dead" to one of the top walleye fisheries in the country. These dramatic changes have created high expectations among anglers and others regarding the future of Great Lake recreational fisheries. Similarly, commercial state licensed and tribal fisheries have seen dramatic changes. Over the last 20 years they have benefitted from increased whitefish populations following the impacts of fishery management efforts to control lamprey and have seen other species decline, fluctuate, or be placed off-limits. Many Great Lakes fishery users have different and frequently conflicting expectations for the future of the resource. Having leaders from the various user groups trained to understand the biological basis, biological limitations, and tools used in fisheries management in the Great Lakes will lead to better informed fisheries management decisions. The purpose of this module is to remove the mystery around fisheries jargon, management tools, and stock assessment. This module will introduce participants to the principles of fishery science that are basic to fishery management. Participants will learn about the ecological, economic, political, and socio-cultural environment within which Great Lakes fishery management operates and the fisheries management techniques applied to achieve fishery management objectives. Development of module will be led by Minnesota Sea Grant with assistance from the Lake Champlain and Ohio Sea Grant programs and with input from regional partners (such as the Great Lakes Fishery Commission and State DNRs).

Project 4: Update “Genetic Guidelines for Fisheries Management”

Minnesota Sea Grant will update its 15-year old publication “Genetic Guidelines for Fisheries Management” by Kapuscinski and Jacobson. This publication has been widely distributed to fisheries managers to provide a primer on genetic principles and techniques. Rapid advancements in genetics, especially concerning molecular techniques and the advent of

transgenics, necessitate an update of this document to provide important genetic information to a new generation of fisheries managers and the public.

Module 6: Great Lakes Fishery Agencies: Institutional Arrangements, Funding and Politics

One of the most significant knowledge gaps citizen volunteers face in effectively addressing Great Lakes fishery issues is an imperfect understanding of who is responsible for the various aspects of fisheries policy coordination and development, management and enforcement. The Institutional Arrangements, Funding and Politics module is designed to address this need. The curriculum developed for this module will identify all international, regional, federal and state institutions and agencies with a role in Great Lakes fisheries research and management, outline their authorizing legislation or legal foundation, explain their mandates and roles, identify those other organizations with which they most often interact, describe the mechanisms through which those interactions occur, and name key contact positions and people. This module will also outline how the various institutions and agencies are funded. It will identify the key legislators and committees with responsibility either for appropriating operating funds or for other legislative issues related to the agency. In order for graduates of the Great Lakes Fishery Leadership Institute and other stakeholders to be most effective they will require a firm understanding of Great Lakes institutional arrangements and funding authorities. Once they understand who is responsible for the various aspects of policy development, research and management, they will be better prepared to identify the administrators and legislators with whom they need to work to address the issues they wish to see resolved. Participants will receive a 15-20 page handout of the material detailed above, as well as a chart graphically depicting the various relationships covered in the material. In addition, this material will be made available on the Michigan Sea Grant website where it can be updated as needed. The webpage will be linked to all other Great Lakes Sea Grant sites as well as to those of our partners. Michigan Sea Grant will lead the effort to develop the above piece and will work closely with Sea Grant partners, such as the Great Lakes Fishery Commission, the U.S. Fish and Wildlife Service, the U.S.G.S. Great Lakes Science Center, state and other agencies to provide content and input into the materials.

Module 7: Public Participation

Public participation is an important aspect of maintaining adequate support for the Great Lakes fishery. Recent surveys indicate that public participation by anglers is declining while public participation in other recreational fish-related industries (such as scuba and tourism) may be increasing. This module will outline key public sectors defining the needs of each and discuss mechanisms for enhancing public participation in Great Lakes fisheries.

Project 5: Great Lakes Charter Fishing Survey

The Great Lakes Charter industry is an excellent case study of a water dependent, resource based, tourism business that can have significant economic impact in small coastal communities.

The charter industry provides important angler access to sport fishing in the Great Lakes. Charter captains are important “gatekeepers” of angling information and have valuable insight into angler issues, fishery concerns and social values that should be incorporated into fishery management decisions. We intend to survey the Great Lakes charter industry in order to describe the industry and the environment in which it operates. We will analyze the 2002 business conditions of Great Lakes charter firms and compare and contrast the data from the 2002 season with results from our previous 1994 Great Lakes wide charter survey. Leaders who understand the needs, issues and business conditions of the Great Lakes charter industry will be better prepared to work to help improve the viability of this important sport fishing sector. A baseline survey of the Lake Champlain Charter industry will also be conducted and separately analyzed. Ohio will provide the leadership for conducting this survey with the assistance of New York, Michigan, Lake Champlain and the other Great Lakes Sea Grant programs.

Project 6: A Community Guide to Increasing Fishing Participation in the Great Lakes

An anticipated decline of 8% (589,000 anglers) in fishing participation by anglers between the ages of 18 and 44 is expected by 2005 in New York State (Connelly et al. 1999). Similar declines are anticipated in other states throughout the Great Lakes region. The potential impacts of these declines on local economies could be enormous. From 2000 to 2001, New York Sea Grant conducted a study of anglers designed to identify the social and psychological factors that influence fishing participation by males and females during childhood, adolescence, and adulthood. In addition, two focus groups of sportfishing-related business owners and state agency staff have been organized for New York's Great Lakes region. These efforts are being used to identify strategies for boosting fishing participation by males and females during childhood, adolescence, and adulthood. Existing strategies being used by groups such as the American Sportfishing Association and the Recreational Boating and Fishing Foundation to increase sportfishing participation have also been identified.

Using the results obtained from its angler participation study and business owner focus groups, New York Sea Grant will develop a "Community Guidebook for Increasing Sportfishing Participation" for use by communities, tourism promotion agencies, and chambers of commerce throughout all Great Lakes States. The guidebook will include promotional and educational strategies that can be implemented by communities and organizations to increase sportfishing participation. The guidebook will be available in hardcopy as well as on the Internet. In addition, a PowerPoint presentation will be created for use by extension staff for community groups which will explain strategies that could be implemented to increase sportfishing participation.

Coordination

The Great Lakes Fisheries Leadership Curriculum Development and Great Lakes Fisheries Leadership Institute will be coordinated by Rochelle Sturtevant, Great Lakes Sea Grant Extension Agent at the Great Lakes Environmental Research Laboratory (NOAA/GLERL). This position was developed in part to increase regional coordination of the Great Lakes Sea Grant Network as well as to increase transfer of scientific expertise from NOAA/GLERL to Great Lakes constituents via Great Lakes Sea Grant Extension. As such, the position is uniquely suitable as a springboard for coordination of a regional effort. Like the regional position itself, fisheries extension coordination funds will be budgeted through Michigan Sea Grant. NOAA/GLERL hosted the Great Lakes Sea Grant Network planning sessions for development of the Fisheries Extension Enhancement proposals, including the session for input from partners. Similar meetings and conference calls needed as the process unfolds will also be hosted at NOAA/GLERL. For work on the Great Lakes Fisheries Leadership Curriculum Development, individual programs have taken responsibility for development of particular curriculum elements (as outlined above) and coordination will consist principally in prevention of overlap or gaps. Great Lakes Sea Grant Network Communicators have produced a catalog of fisheries outreach materials currently available through each program which should assist in identifying programs

likely to want significant input into development of individual curriculum elements. Communicators will also develop a consistent 'look' for all curriculum elements to aid integration into a single package.

Outcomes and Impacts

The immediate result of this work will be a comprehensive, consistent set of curriculum materials for use by all of the Great Lakes Sea Grant programs which will serve as the foundation for a long-term, sustained expansion of the Great Lakes Sea Grant Fisheries extension program. Development of this consistent curriculum will increase integration of the Great Lakes Sea Grant Network fisheries programming while maintaining flexible local implementation. Inclusion of our partner agencies in the development of these curriculum materials will help to ensure their use by and usefulness to these agencies, help to ensure the quality of the product and its usefulness to stakeholders, as well as to improve Sea Grant partnerships with these fisheries agencies. When delivered to emerging Great Lakes fishery leadership via the proposed Great Lakes Fishery Leadership Institute, these products will make a demonstrable difference in the level of understanding of key stakeholders and constituents resulting in improved effectiveness of their home organizations as well as important Great Lakes advisory groups such as the Lake Committees.

Evaluation

Training will be provided at state, lake, and regional levels both in connection with the Great Lakes Fisheries Leadership Institute and over a period of several years by individual programs. This ongoing delivery of educational module projects will enable a constant dialog among trainers and participants (Institute and/or workshop students) to: 1) document knowledge gaps; 2) monitor/improve/update module delivery; and 3) assess the effectiveness of delivery (i.e. workshop evaluations). We anticipate that both formal and informal evaluation during the implementation phase will be readily accomplished due to the relatively small size of the institute(s), and the vested interest held by the participants. At a minimum, workshop evaluations will be conducted at each training event/site. Summaries of these evaluations will be available to subsequent trainers/organizers, for overall evaluation of the Great Lakes Fisheries Leadership Institute, and for the conclusion of the Fisheries Extension Enhancement program.

Of particular interest will be the expected behavior changes exhibited by Institute and/or workshop participants at some period after conclusion of the training session. Though specific criteria have yet to be developed, we may be able to track various overall constituent behavior changes and/or benefits to fishery resources. For example, we should be able to demonstrate an increase in contacts (or interactions) involving Institute participants and elected officials. We may also be able measure changes in the makeup or effectiveness of the various advisory committees. Where such evaluation is beyond the time frame of this proposal, we will seek outside resources that might enable such long-term evaluation.